The secondary mestome bundles, which have originated from the secondary parenchyma, serve naturally as carriers of such substances as are useful to the plant. This is very conspicuous in *Dioscorea*, where starch grains form heavy masses around the mestome bundles; this starch becomes transformed, however, upon the renewed growth in the spring. At this time it takes a reddish-violet color with iodine, and the grains near the mestome bundles have decreased in size and look as if they were partly digested. THEO. HOLM.

The role of the pericycle in the root of Dracæna marginata.[4]

The roots in certain monocotyledons show an increase in diameter, a fact that has been observed in *Aletris fragrans*, and in some species of *Dracæna*, e. g., *D. marginata*, *D. reflexa*, *D. fruticosa*, *D. Draco* and *D. rubra*. It has been demonstrated in most cases that the secondary parenchyma, to which this increase in diameter is due, is of a pericyclic origin. The cells of the pericycle divide tangentially and give rise to a secondary tissue with centrifugal development; some of these cells begin, thereupon, to divide in various directions and produce procambial strings, which soon become differentiated into a corresponding number of secondary mestome bundles. The central cylinder, therefore, is the structure which undergoes an increase in diameter.

Some cases have been recorded, however, where similar secondary formations were not of pericyclic origin, but developed in the bark. This fact was observed in *Dracæna reflexa* and *D. marginata* by Morot.[5] The pericycle had in these cases, nevertheless, preserved a certain activity, showing a few divisions of its cells.

Some analogous observations have been made by the author, who has studied the structure of the roots of *Dracæna marginata*. All the roots showed the presence of secondary formations in the bark itself. The pericycle had to a certain extent been multiplied, and had here a true mechanical function, not previously noticed. A transverse section of one of these roots, in which there is not yet any sign of secondary formations, shows an endodermis, the cell walls of which are

[4] DE CORDEMOY, Du rôle du péricycle dans la racine du *Dracæna marginata*. Bull. de la soc. bot. de France, **40:** — 1893.

[5] LOUIS MOROT, Recherches sur le péricycle. Ann. d. sc. nat. Bot VI. **20:** 217. 1885.

thickened so as to constitute a U-endodermis. Inside this is a simple pericycle, where some cells show a tangential division; the groups of leptome and hadrome border on this pericycle, as in other roots. But a root measuring about 72^{mm} in diameter shows that these tangential divisions of the pericycle do not produce any secondary parenchyma. There is, however, a secondary parenchyma present, but this is located in the bark, representing a secondary bark, of which the primary layers rest immediately upon the endodermis. The secondary meristem, from which these tissues have originated, has been formed in the innermost layers of the primary bark. When this secondary parenchyma developed in the bark, the pericycle commenced to show tangential divisions in various places, especially where it consisted of from seven to eight rows of radially arranged cells.

This increase of the pericycle causes a pressure from the interior to the exterior; thus the endodermis becomes ruptured in certain places, and a communication opens between the central cylinder and the cortical zone. The cells of the pericycle come to be, in this way, in contact with the secondary bark. These pericycle cells show, thereupon, a beginning sclerosis of their membranes.

The result of this investigation is that although the secondary formations in the root of *Dracæna* have originated from the bark, the pericycle may, nevertheless, show a certain activity, so as to produce a pressure from the interior to the exterior, by which action the endodermis becomes ruptured. A communication is thus established between the two conducting systems, the primary and the secondary.

THEO. HOLM.

Vegetable ferments.

There is hardly any branch of physiology which claims our attention more than that including the ferments. In the animals, as well as in the plants, their action is so important that it is impossible to form any opinion of the act of nutrition unless we keep a steady look at the ferments. Much has not been done yet, but it is a very desirable work that has been done by Professor J. R. Green,[6] namely, "to give some account of the various vegetable enzymes now known to ex-

[6] On vegetable ferments. Annals of Botany **7:** 83–137. 1893.